In the Claims:

A complete listing of all claims pending, amended and canceled is included as follows:

What is claimed is:

1. (currently amended) An apparatus for photo-electric measurement comprising:

a) a single or a plurality of photo-electric conversion devices, including array sensor(s);

b) an optical system ~~which is modularly~~ comprising modules which are arranged and expandable in one axis or a plurality of axes in order to acquire electromagnetic radiation from a correspondingly modularly increasing length of a line or area ~~of any desired size~~ on an object, with any desired resolution, wherein the said optical system spatially separates the said electromagnetic radiation modularly into a plurality of smaller segments, and projects electromagnetic radiation corresponding to the said smaller segments onto said single or a plurality of individual photo-electric conversion devices, wherein said smaller segments of electromagnetic radiation originate from adjacent regions of the line or area on the object, said adjacent regions partially overlapping such that contiguity is achieved; and

c) sensor electronics related to said photo-electric conversion device(s) which enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions are fully programmable, and said photo-electric conversion device~~(s) may~~ operate and/or ~~be~~ are controlled independently and/or simultaneously.

2. (cancelled)

3. (currently amended) The apparatus according to claim 1, wherein the said segments of electromagnetic radiation originate from ~~one or~~ a plurality of regions on the line or area to be measured, whereby the regions are adjacent to each other, or there ~~may be~~is space corresponding to regions of no measurement interest between the said regions, wherein the apparatus provides its functionality only for regions to be measured.

4. (currently amended) The apparatus according to claim 1, wherein said optical system provides a magnification which ~~may be~~is more than, equal to, or less than one.

5. (previously presented) The apparatus according to claim 1, wherein said photo-electric conversion device(s) comprise a plurality of readily available, off-the-shelf array sensors positioned adjacent to each other, wherein said array sensors comprise semiconductor die(s) which are housed in an integrated circuit package.

6. (previously presented) The apparatus according to claim 1, wherein said photo-electric conversion device(s) comprise a plurality of buttable array sensors positioned adjacent to each other, being stackable side-to-side such that there is minimum dead space between the active areas.

7. (currently amended) The apparatus according to claim 1, wherein said photo-electric conversion device(s) include any one or any subset of the following features:
a) a means of clearing charge from the photo-electric conversion device(s) very fast,
b) summing well(s) at each of the output(s) of the photo-electric conversion devices,
c) metal strapped gates and connections to increase clocking speeds,
d) thinned, back-illuminated CCD technology,
e) low dark current "Multi-Pinned Phase (MPP)" operation mode,
f) frame transfer architecture,
g) interline transfer architecture,
h) full-frame transfer architecture,
i) charge amplification on the photo-electric conversion device;

j) fiber optic bundle(s) directly bonded to the photo-electric conversion device,

k) a single or a plurality of outputs,

l) a single or a plurality of serial (readout) register(s),

m) segmentation of the photo-electric conversion device(s), whereby all segments ~~may be~~are read and/or controlled individually and/or simultaneously.

n) integrated microlenses,

o) anti-blooming in the active area, storage area and/or serial register(s).

p) Charge multiplication integrated on the image sensor.

8. (currently amended) The apparatus according to claim 1, wherein said optical system comprises the integration of one or any combination of refractive, diffractive, reflective, fiber optical and spatially filtering micro-optical components, and/or one or more arrays thereof.

9. (previously presented) The apparatus according to claim 1, further comprising a cooling means, using thermoelectric (Peltier) device(s) for cooling and/or temperature regulating said photo-electric conversion device(s).

10. (previously presented) The apparatus according to claim 9, further comprising an enclosure which houses said cooled photo-electric conversion device(s) and related cooling means for preventing condensation on surfaces which are in the optical path, wherein said enclosure is hermetically sealed, and under vacuum or filled with an inert gas.

11. (previously presented) The apparatus according to claim 1, wherein said optical system forms an integral part of an enclosure which houses said photo-electric device(s).

12. (previously presented) The apparatus according to claim 1, wherein said optical system is factory pre-aligned spatially and spectrally with respect to said photo-electric conversion device(s).

13. (previously presented) The apparatus according to claim 1, further comprising a means of

exciting (illuminating) the target object (30) with electromagnetic radiation wherein the focus thereof is factory pre-aligned spatially with respect to the said optical system and photo-electric conversion device(s) such that the measurement performance is optimized, wherein the said measurement performance comprises one or a plurality of the following: focal, spectral and spatial positioning and resolution; sensitivity; limit of detection, acquisition speed.

14. (previously presented) The apparatus according to claim 1, wherein excitation (illumination) electromagnetic radiation is acquired and said optical system includes a means for coupling into the optical system, and focusing said excitation (illumination) electromagnetic radiation at the line or area to be measured.

15. (currently amended) The apparatus according to claim 13, wherein the apparatus includes a means for spatially varying the said excitation (illumination) at the line or area to be measured, wherein said means is real-time programmable, integrated with the optical system, and uses LCD-, acousto-optic~~,~~ or micro-mirror-based spatial light modulator(s) ~~or the like~~.

16. (previously presented) The apparatus according to claim 8, wherein all components of the apparatus are tightly integrated into a compact, miniaturized measurement unit, with all of said micro-optical components permanently fixed relative to each other and to said photo-electric conversion device(s), with no mechanical adjustments.

17. (previously presented) The apparatus according to claim 1, wherein the said optical system includes a means for spreading electromagnetic radiation according to wavelength, and projects the resulting spectra onto said photo-electric conversion device(s).

18. (currently amended) The apparatus according to claim 1, wherein the functionality of said optical system and said photo-electric conversion device(s) is ~~spatially~~ variable, corresponding to the spatial location on the line or area such that for example measurements of various types can be simultaneously performed.

19. (currently amended) The apparatus according to claim 1, wherein said optical system is a confocal system, and comprises at least one spatial filter whereby electromagnetic radiation from a plurality of points on the line or area to be measured is spatially filtered at particular refocusing points and/or planes, and said spatial filter is implemented by a pinhole or slit which ~~may be~~is implemented using absorptive, diffractive, refractive element(s), and/or ~~may be~~is defined by one or a plurality of programmable sub-area(s) of pixels of said photo-electric conversion device(s).

20. (previously presented) The apparatus according to claim 17, wherein the apparatus is modularly expanded in a first direction to measure a particular length of a line on an area presented by a target object, and comprises means for moving, the apparatus in a stepped and/or scanned manner in a second direction in order to measure said area.

21. (previously presented) The apparatus according to claim 20, wherein said apparatus produces image(s) of an area or a plurality of sub-areas thereof, whereby said photo-electric conversion device(s) is/are operated in "Time Delayed Integration" mode, line scanning mode, or imaging mode.

22. (previously presented) The apparatus according to claim 21, wherein the electromagnetic radiation from the area to be measured, or sub-areas thereof, is separated into its wavelength components and projected onto said photo-electric conversion device(s) and wherein the spectral axis is perpendicular to the axis of movement of the apparatus.

23. (previously presented) The apparatus according to claim 17, wherein a plurality of measurement lines in said first direction are simultaneously measured, said measurement lines being positioned sequentially in the direction of movement of the apparatus.

24. (currently amended) The apparatus according to claim 17, wherein said means of spreading electromagnetic radiation according to wavelength comprises a binary grating~~, particularly preferred is~~with a single level or single mask binary grating, wherein the odd or minus one and even or plus one first order spectra are both acquired simultaneously by the apparatus.

25. (previously presented) The apparatus according to claim 24, further comprising combining means for combining said odd and even first order spectra on the photo-electric conversion device(s), during the readout process via pixel binning.

26. (original) The apparatus according to claim 24, wherein said sensor electronics combines said odd and even first order spectra in analog manner.

27. (previously presented) The apparatus according to claim 24, wherein said sensor electronics combines said odd and even first order spectra digitally, in a real-time, in-line fashion.

28. (previously presented) The apparatus according to claim 24, wherein said controller combines said odd and even first order spectra digitally, in a real-time, in-line fashion.

29. (previously presented) The apparatus according to claim 1, wherein an excitation (illumination) source and related electronics are an integral part of the apparatus, whereby said optical system delivers electromagnetic radiation from said optical source to the object to be measured.

30. (currently amended) The apparatus according to claim 1 for "excitation gated" and/or "emission lifetime" --aided measurements, comprising:

a) means for pulsing ~~the~~ an excitation (illumination) source, whereby a measurement ~~may~~ includes a single or a plurality of said pulses,
b) means for sensing the electromagnetic radiation pulse at the wavelength band corresponding to ~~an~~ the excitation (illumination) source and means for detecting the electromagnetic radiation pulse at the plane of the said photo-electric conversion device(s),
c) means for collecting desired electromagnetic radiation by the active area of said photo-electric conversion device(s) only during a programmably defined time, relative to the excitation pulse, and
d) means for integrating/summing the emission signal collected after each excitation pulse in shaded "storage" regions on the said photo-electric conversion device(s), which are read after a single or a plurality of excitation pulses, wherein said collecting means and said integrating/summing means are implemented on an individual pixel basis.

31. (original) The apparatus according to claim 30, wherein the sensing means, detecting means, collecting means and integrating/summing means, as well as all related circuitry are integrated onto the said photo-electric conversion device(s).

32. (original) The apparatus according to claim 30, wherein the sensing means, collecting means and integrating/summing means are integrated on separate photo-electric conversion device(s), and the pulsing means and the detecting means are located in close proximity to the photo-electric conversion device(s).

33. (previously presented) The apparatus according to claim 1, further comprising a means of mechanically moving and/or positioning the apparatus in up to three dimensions with respect to the object to be measured, wherein the said means of positioning is further controllable by said controller in real time during measurement

34. (previously presented) The apparatus according to claim 1, further comprising a controller, and an intelligent detector, wherein said controller is an integral part of the apparatus.

35. (previously presented) The apparatus according to claim 34, for use with overlapping segments and further comprising means for separately transmitting the results of measurements from the overlapping segments to the controller, where they are combined into a single data stream.

36. (previously presented) The apparatus according to claim 34, for use with overlapping segments and further comprising means for combining the results of measurements from the overlapping segments into a single data stream by the said sensor electronics, and for transmitting the single data stream to the controller.

37. (previously presented) The apparatus according to claim 34, for use with overlapping segments and wherein a processing means in said controller compensates for the overlapping of segments, providing a result representing the measurement of the entire line or area without gaps.

38. (original) The apparatus according to claim 37, wherein said processing means comprises programmable logic and a related software program.

39. (original) The apparatus according to claim 37, wherein said processing means comprises a micro-controller and a related software program.

40. (original) The apparatus according to claim 37, wherein said processing means comprises one or a plurality of Digital Signal Processor(s) (DSP) and related software program(s).

41. (previously presented) A method of optimising measurement of the said spectra in real-time using the apparatus according to claim 17, wherein the relatively higher electromagnetic radiation from the zeroth order and/or from excitation (illumination) source(s) are sensed by the said photo-electric conversion device(s) and information derived immediately used to adapt for the actual location of the spectra, wherein the said zeroth order and/or excitation, as well as a plurality of spectral bandwidths are sensed via programmable two-dimensional pixel binning.

42. (previously presented) A method of optimising performance in real-time during measurement using the apparatus according to claim 34, wherein the measurements obtained from a single or a plurality of measurement lines is immediately evaluated by the said controller, and the result used to optimize the measurement performed by a single or a plurality of following measurement line(s).

43. (previously presented) A method of optimising performance in real-time during measurement from plane areas which are tilted (non-parallel) with respect to the apparatus, using the apparatus according to claim 34, wherein the position of the apparatus is adapted during the measurement such that the focus along the entire measurement line is optimal.

44. (currently amended) A method for optimization of sensitivity of the apparatus according to claim 34 in real time during the measurement process, whereby the location and size of the sub-areas of pixels used to measure particular wavelength bands of the spectra projected onto said photo-electric conversion device(s) are optimised by the said controller based on information previously acquired by the apparatus~~, wherein in particular, spectral resolution versus sensitivity tradeoff is optimised~~.

45. (currently amended) A method for optimization of the performance of the apparatus according to claim 34 in real time during the measurement process, whereby the spectral axis of measurement on the said photo-electric conversion device(s) is calibrated in real time using information derived from the current or previously measured spectra, wherein ~~preferred~~ features in the spectra which are used for the said optimisation include the excitation (illumination)

signal, reference spectral standards on the object to be measured and/or ~~,~~ known RAMAN scatter profiles~~, and the like~~.

46. (currently amended) A method of optimising performance in real-time during measurement using the apparatus according to claim 34, wherein information is acquired by the apparatus from the object to be measured, and directly used to optimize the measurements, wherein said information ~~may~~ originates from a sample carrier, and/or from the samples themselves.

47. (previously presented) A method of optimising performance in real-time during measurement using the apparatus according to claim 34, wherein optical and measurement effects of mechanical tolerances, non-ideal mechanical motion are reduced or eliminated, wherein spectral effects by real-time spectral calibration, using references on the object for optimization of measurements in real-time, are corrected.

48. (currently amended) A method of automating the processing and/or information management of the target object(s) and/or samples to be measured using the apparatus according to claim 34, wherein information acquired by the apparatus from said object or samples to be measured ~~may~~ serves as identification, ~~may define or influence the processing, or the like,~~ wherein said information ~~may~~ originates from a sample carrier, and/or from the samples themselves.

49. (currently amended) A method for information management of the target object(s) and/or samples to be measured using the apparatus according to claim 34, wherein the apparatus ~~may~~ stores or writes information on the said object or samples.

50. (currently amended) A method for real time measurement during end-point measurement after processes and reactions using an apparatus for photo-electric measurement comprising:

a) a single or a plurality of photo-electric conversion devices, including array sensor(s);

b) an optical system which is modularly expandable in one axis or a plurality of axes in order to acquire electromagnetic radiation from a line or area of any desired size on an object, with any desired resolution, wherein the said optical system separates the said electromagnetic radiation modularly into a plurality of smaller segments, and projects electromagnetic radiation corresponding to the said smaller segments onto said single or a plurality of individual photo-electric conversion devices wherein said smaller segments of electromagnetic radiation originate from adjacent regions of the line or area on the object, said adjacent regions partially overlapping such that contiguity is achieved; and

c) sensor electronics related to said photo-electric conversion device(s) which enable the operating mode and functionality of said photo-electric conversion device(s) to be defined and changed in real-time, whereby functions including the readout sequence of pixels and unlimited flexibility of pixel binning in two dimensions are fully programmable, and said photo-electric conversion device~~(s) may~~ operate and/or be controlled independently and/or simultaneously;

~~for real-time measurement~~ measuring in real-time during a process or at an end-point ~~measurement~~ after a processes, reactions ~~and the like,~~ including those related to chemistry, bio-chemistry, biotechnology, molecular biology~~, and the like, wherein particular preferred processes measure include molecular hybridization processes, Surface Plasmon Resonance, binding between molecules, cells, and the like~~.

51. (currently amended) The method for real time measurement during end-point measurement after processes and reactions of claim 50 wherein the type of measurement comprises at least one of~~for the measurement of~~ fluorescence, laser induced fluorescence, luminescence/chemi-luminescence, fluorescence and luminescence lifetime, reflectance and absorbance.

52. (currently amended) The method for real time measurement during end-point measurement after processes and reactions according to claim 50 wherein the reaction is located on ~~for measurements from~~ microplates, microplates, micro-arrays, biological chips "biochips", samples

spotted onto microscope slides, a plurality of micro-beads.

53. (currently amended) The method for real time measurement during end-point measurement after processes and reactions according to claim 50 wherein the reaction involves~~with detection methods involving~~ Polymerase Chain Reaction (PCR)~~, particularly used for genetic sequence detection~~.